



United States Environmental Protection Agency
EPA Region 10, Office of Water and Watersheds

EPA Region 10 Natural Conditions Workgroup Report on Principles to Consider When Reviewing and Using Natural Conditions Provisions

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*Revisions and updates to this document can be found at www.epa.gov/r10earth/naturalcondition.htm

NOTICE

This document is designed to educate EPA Region 10 staff on the development and application of natural condition water quality standard provisions in Clean Water Act programs. The natural condition provisions are usually found in state and authorized tribal water quality standards.

The information provided in this document is to be used simply for educational purposes for EPA Region 10, and is not intended to be used for any other purpose. Specifically, this document does not impose binding requirements on EPA, states, authorized tribes, or the regulated community or substitute for Clean Water Act (CWA) requirements, EPA regulations, or the obligations imposed by consent decrees or enforcement orders. Furthermore, information included in this document may not apply to a particular situation.

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Executive Summary

EPA Region 10's Principles Regarding Natural Conditions in CWA Programs

This document describes basic principles underlying the creation and use of the natural condition provisions in water quality standards (WQS) under the Clean Water Act (CWA). These principles were derived from the collective experience of EPA staff who have worked on natural condition issues over the past decade. The document recognizes the need for flexibility to address unique circumstances associated with individual water bodies, states and tribes, as long as water quality is protected.

The purpose of this document is to share among EPA staff issues and approaches regarding the development and application of the natural condition WQS provisions in CWA programs. This document provides EPA staff advice on implementing CWA actions (involving natural condition WQ standard provisions), and on reviewing state and tribal CWA actions for EPA approval. The target audience for this document is EPA staff.

All four Region 10 states and many tribes have natural condition provisions in their EPA-approved WQS. Over the years, many questions have arisen over the wording, meaning and use of these natural condition provisions. EPA Region 10 convened a workgroup to develop a document to help its staff better understand and apply natural condition provisions. The workgroup included people with experience in developing and applying natural condition WQS provisions in CWA programs, such as 303(d) listing (list of impaired waters), Total Maximum Daily Loads (TMDLs or water quality improvement plans) and NPDES (wastewater discharge) permits.

Key Principles

The following principles are common to all CWA programs. Generally, decisions based on the application of a natural condition provision should be:

- geographically specific;
- scientifically defensible;
- well-documented and supported with data and information;
- highlighted in a process that provides the public an opportunity for review and comment when natural condition provisions are applied [e.g., in a 303(d) listing decision, in the development of TMDL, in a NPDES permit];
- tracked and accessible to the public.

Furthermore, consider the following when using natural condition provisions:

Water Quality Standards (WQS)

Ideally, WQS with a natural condition provision will include a *definition of a natural condition* (such as “the quality of surface water that exists in the absence of human-caused pollution or disturbance”); a *provision that site-specific criteria may be set equal to a natural condition* and a *written procedure* (e.g., Implementation Plan) on how the state or tribe will determine a natural condition of a water body and *narrative natural conditions criteria for temperature* that allows the natural condition temperature to become the criteria and supercede the numeric criteria when a natural condition determination is made on a case-by-case basis.

303 (d) Listing

Decisions made using a natural condition provision (which allow a water body to be removed or not included on the list) should be ***based on existing and readily available data and information, supported by a site-specific, scientifically defensible rationale*** that does one of the following:

- explains why human activities in a watershed are not directly or indirectly the cause of the exceedance of WQS for the pollutant of concern;
- shows there has been virtually no human activity in the watershed that would affect the water quality parameter in question;
- explains how natural processes alone are adequate to account for the observed exceedance of the water quality standard for the pollutant of concern; or
- shows that the water quality in the watershed is similar to that measured in an undisturbed reference location.

TMDLs and NPDES Permits

We encourage the states or tribes to ***discuss their preliminary approach*** for quantifying or determining natural conditions with EPA staff when developing a TMDL load or wasteload allocation. The following questions may help states and tribes in ***selecting a methodology to use in determining a natural condition***:

- Does a suitable reference watershed or reference location (with similar size, elevation, geology, climate, fauna, flora, flow, etc.) exist?
- Are there adequate data from the reference location?
- Is there an appropriate model that meets the project objectives?
- Is there available expertise to run the model?
- Are there adequate data to use as model input parameters?
- What are the legal, resource and time constraints?

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Introduction

Overview

Naturally occurring concentrations of pollutants (natural condition) in a surface water body may differ from water quality criteria adopted in a state or tribal¹ water quality standards (WQS). To address circumstances where the natural condition of a water body exceeds the criterion, Region 10 states and tribes have adopted natural condition provisions in their WQS that allow the water quality criterion to be changed to reflect the naturally occurring pollutant level or concentration.

All four Region 10 states and some tribes have a natural condition provision in their EPA-approved water quality standards. Over the years, many questions have arisen over what the provisions mean, how they should be implemented and how to best express the concept. EPA Region 10 formed a workgroup that included representatives from the various CWA programs to explore these issues. The following people participated in the workgroup: Jayne Carlin, Kathleen Collins, Kerianne Gardner, Cindi Godsey, Lorraine Edmond, Lisa Jacobsen, Marcia Lagerloef, Lisa Macchio, and Lisa Olson. Christine Psyk and Paula VanHaagen provided managerial support; Adrienne Allen, Keith Cohon and Cara Steiner-Riley provided legal support; and Deborah Neal provided communications support.

This document is meant to help EPA staff who work with natural condition issues. Principles and recommendations found in this document are derived from the experiences of those who have worked on state and tribal water quality standards (WQS) and used these provisions in Clean Water Act (CWA) programs, such as 303(d) listing (list of impaired waters), Total Maximum Daily Loads (water quality improvement plans) and NPDES (wastewater discharge) permits, over the past decade.

These provisions are applied in CWA programs that implement state and tribal WQS, such as:

- Clean Water Act Section 303(d) listing/delisting (hereafter referred to as 303(d) listing): If the natural condition of the water body exceeds the applicable water quality criterion and the state or tribal WQS has a natural condition provision, it may not be necessary to list the water body as a water quality limited segment on the state's 303(d) list.
- Development of Total Maximum Daily Loads (TMDL): If the natural condition of a water body exceeds the applicable water quality criterion and the state or tribal WQS has a natural condition provision, the natural condition may be used as the target in the TMDL.
- National Pollutant Discharge Elimination System (NPDES) permits: A water quality criterion may be adjusted on a site-specific basis to reflect the natural condition of a water body that exceeds the applicable water quality criterion. The adjusted (natural condition) criterion could then be used to develop effluent limits for NPDES permits.

In addition, natural condition provisions arise in the following areas:

¹ This term "Tribe" refers to Tribes with EPA-approved "Treatment as a State (TAS)" for Water Quality Standards and EPA-approved water quality standards (WQS).

- Endangered Species Act Consultation: ESA consultation is not discussed in this document. However, as appropriate, EPA must communicate and consult with the U.S. Fish and Wildlife Services (FWS) and National Oceanic and Atmospheric Administration (NOAA)--Fisheries (also known as "the services") under Section 7 of the Endangered Species Act (ESA) when taking actions in CWA programs.
- EPA Roles and Tribal Communication: EPA has a trust responsibility to tribes. In exercising that responsibility, EPA coordinates and, when appropriate, consults with potentially affected federally recognized tribes when implementing CWA programs.

Purpose

The purpose of this document is to share among EPA staff issues and approaches regarding the development and application of the natural condition WQS provisions in CWA programs. This document provides EPA staff advice on implementing CWA actions (involving natural condition WQ standard provisions) and on reviewing state and tribal CWA actions for EPA approval. The target audience for this document is EPA staff. The principles contained in this document are intended to be flexible enough to deal with the unique circumstances of each situation while ensuring that water quality is protected. This document does not impose any requirements and it does not set out legally sufficient conditions for any particular action. It merely sets out considerations and some recommendations for addressing natural condition issues.

Contents

The document includes:

- Recommended definition of natural condition.
- Recommended elements of a natural condition provision (including examples of natural condition language within the WQS of EPA Region 10 states and tribes).
- Discussion of how the natural condition provisions are applied in 303(d) listing, TMDL development and NPDES permitting.
- Methodologies for making a natural condition determination.
- Discussion of the threshold level of documentation recommended to define the natural condition of a water body and demonstrate that the natural condition exceeds the applicable criterion.
- EPA's role in the development and application of the state's or tribe's natural condition provisions.
- Definitions of terms commonly used in WQS or water quality management programs that may be related to natural conditions.

Recommendations

When applying the natural condition provisions under any of the CWA programs, we recommend that:

- Decisions be **geographically specific, well-documented and supported** with data and information; and
- A **public participation process** be used that provides the public with an opportunity to comment on the basis for applying any natural condition provision at the time of use.

Water Quality Standards and Natural Condition

A. About Water Quality Standards

Water Quality Standards (WQS) define the goals for surface waters (lakes, streams, rivers, wetlands, marine waters, and other surface waters) through the establishment of designating uses, criteria to protect those uses, and provisions to protect water quality from degradation.

The CWA requires that states and tribes adopt WQS to protect all forms of aquatic life, as well as human health and recreation in and on the water.

WQS consist of four basic elements:

- Uses (Existing and Designated) of the water body (e.g., recreation, water supply, aquatic life, agriculture).
- Water quality criteria to protect uses (numeric pollutant concentrations and narrative requirements).
- An anti-degradation policy to maintain and protect existing uses and high quality waters.
- General policies addressing implementation which provide the state or tribe the flexibility to adjust designated uses or criteria on a site-specific basis (e.g., mixing zone policy, variance policy, site-specific criteria procedures, policies regarding low flows).

B. Addressing Natural Conditions in Water Quality Standards

If a state or tribe would like to include provisions in their water quality standards to address naturally occurring conditions in surface waters, then the following elements are important:

- A definition of natural condition included in the WQS regulations.
- A provision in the WQS regulations that provides for criteria to be set equal to natural conditions.
- A written procedure (e.g., Implementation Plan) for how the state or tribe will make a natural condition determination for a water body. This can be documented either in the WQS regulations or in a separate policy/guidance document outside the WQS regulations.
- A description of the public participation process that the state or tribe will utilize in the process of establishing criteria based on natural conditions.

1. Natural Condition Definition

Natural condition is a term that describes the quality of surface water that exists in the absence of human-caused pollution or disturbance. Natural conditions currently exist in very limited settings. We recommend including information in the definition describing what *would not* be considered a natural condition, including:

- ***Historic or existing human impacts.*** Water quality that has been or is currently impacted by industry (e.g., mining, pulp and paper mills, atmospheric deposition), or is substantially impacted by other human activities (e.g., urbanization, agriculture, grazing, timber harvest, etc.).
- ***Irreversible human impacts.*** Permanent anthropogenic landscape changes that may not be feasible to reverse (e.g., dams).
- ***Human-caused conditions*** (or “anthropogenic impacts”) from sources outside the watershed, such as atmospheric deposition.
- ***Ambient, upstream*** (e.g., “background”) or ***best attainable conditions***.

2. **WQS Approaches to Setting a Pollutant Equal to the Natural Condition**

The following three approaches allow a state or tribe to set a criterion for a naturally occurring pollutant equal to a level or concentration that occurs naturally:

- Development and adoption of a ***site-specific criterion through rule-making***, which is a formal change to the state or tribal WQS regulations,
- Use of a ***performance-based approach*** that relies on an EPA pre-approved process, or
- Use of ***narrative water quality criteria***.

Each of the three approaches above entail slightly different procedural components and are based on different mechanisms in the WQS regulations. However, the following are common elements in all three approaches:

- 1) a definition contained in the state or tribal WQS regulations,
- 2) a provision in the WQS regulations that provides the authority for a natural condition-based criterion to replace the otherwise applicable criterion, and
- 3) a clear description of the scientifically defensible approach used in the derivation of the numeric value.

Lastly, under any of the three approaches, the state or tribe must satisfy EPA's appropriate public involvement requirements and EPA should satisfy any consultation requirements necessary to fulfill our obligations under the Endangered Species Act.

The following provides a more detailed discussion of each approach.

Site-Specific Criterion Through Rule-Making Approach

Development of a numeric site-specific criterion through a formal change in the WQS (via rule-making) is EPA's nationally recommended approach.² Each natural condition based numeric site-specific criterion is formally adopted by the state or tribe through a regulation change. The adoption of the site-specific criterion through a WQS regulation provides a logical and straightforward means for other CWA

² EPA HQ Memorandum, “Establishing Site-Specific Aquatic Life Criteria Equal to Natural Background,” Tudor Davies, Director of the Office of Science and Technology, November 5, 1997.

programs to identify the applicable criterion, the pollutant and the waterbody. However, because this approach entails numerous steps, which include fulfillment of the state or tribal rule-making process and all associated requirements, it is generally the more resource-intensive approach.

The site-specific criterion approach first involves development of a proposed criterion by the state or tribe. The process is predicated on the specific mechanism the state or tribe typically uses when it develops new and/or revised WQS regulations. For example, it may entail simply the involvement of the state or tribal technical staff, or it may involve the formation of a stakeholder group, a negotiated rule-making group or a technical and/or policy subcommittee. States and tribes typically involve EPA early on in the review and development of the methodology and work plan that will be used in the derivation of a site-specific criterion.

Once the state or tribe has developed a proposed naturally based criterion, public comments would be solicited on both the proposed criterion, as well as the scientific basis and methodology used in the criterion derivation. EPA would also review and comment on the proposed site-specific criterion and methodology.

The state or tribe then finalizes the site-specific criterion through adoption into its WQS regulations. These revised WQS regulations are then submitted to EPA for final review. The process culminates in an EPA approval or disapproval of the site-specific criterion.

Performance-Based Approach

The performance-based approach is based on an EPA “pre-approved” detailed process which establishes the procedures to be followed each time a natural condition-based criterion is to be derived.³ The performance-based approach to a natural conditions based site-specific criterion relies on the adoption of a process (i.e., a written procedure to derive the criterion) in the WQS regulations.

The process, which is incorporated into the WQS regulations, is described in sufficient detail that the results are clearly reproducible. The regulatory procedure would specify a methodology, data requirements and the decision criteria for making a natural condition determination. An alternative approach to adopting the detailed methodology/procedure into the regulations is to reference the document which contains the detailed methodology/procedure in the regulations.

During the adoption of the procedure, all stakeholders and EPA would have an opportunity to make sure that important technical issues or concerns are adequately addressed in the procedure. Although the resulting individual decisions would not need to be codified in state regulation and would not need to be submitted to EPA for review and approval under CWA section 303(c), the input data for a particular site would need to be reviewed by the public at the time the procedure is applied.

³ The preamble to EPA’s final rule on *EPA Review and Approval of State and Tribal Water Quality Standards* (65 FR 24648, April 27, 2000) defines a “performance-based” approach for the development of criteria. See Appendix B for language in preamble pertaining to performance-based approach.

Such a procedure should assure that threatened and endangered species (or critical habitat) are protected where the natural condition criterion is applied. As with all other new and revised water quality standards, such a procedure would have to be submitted to EPA for review and approval.

An advantage of the performance-based approach is that it does not require formal rule making and changes to the state or tribe's WQS regulations and EPA review and approval each time a natural condition criterion is developed. However, if the performance-based approach is not sufficiently detailed, then it may not be approvable unless EPA retains the ability to review each proposed application of the natural condition provision.

We recommend states and tribes have a formal mechanism in place for recording and tracking water quality criteria that have been derived using the performance-based approach. The state or tribe would maintain a publicly available list of all waterbodies to which the natural condition determination is made. We also recommend that states and tribes officially incorporate the revised natural condition-based numeric criterion that was established using the performance-based approach, into their WQS during the next triennial review. Incorporating these criteria changes into the WQS would facilitate tracking the natural conditions criteria.

As with each approach for establishing a natural condition-based criterion, public participation is an integral component of the performance-based approach.

Narrative Water Quality Criterion Approach

The narrative water quality criterion approach allows the natural condition criterion to become the criterion for a specific parameter where either the state or tribe had none previously or to replace a previous numeric criterion. We recommend this approach for temperature in its *EPA Region 10 Temperature Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (see pages 36-39) (USEPA, 2003).

We believe that the use of a narrative criterion to express natural background is a reasonable approach which provides the needed flexibility to address case-specific situations. Narrative criteria are established for situations where criteria are interpreted on a case by case basis because no single value could be determined to be applied on a statewide basis. Narrative criteria are most often interpreted and implemented on a water body-specific basis. This typically occurs at the time of the application in a specific regulatory context, such as development of TMDL allocations or NPDES permit limits.

Sample wording for a narrative provision would be as follows: "When the natural background conditions exceed the applicable water quality criteria for specific waters, the natural conditions shall become the applicable criteria." The narrative-criterion approach does not result in adoption of a WQS regulation each time a natural condition-based criterion based on a narrative provision is derived. EPA would review and take action on the narrative provision. EPA would not take action under CWA 303(c) on subsequent applications of the narrative criterion. However

other CWA programs might take action, such as the submission to EPA of a 303(d) list, or a TMDL. EPA currently is the agency authorized to issue NPDES permits in Idaho, Alaska, and on tribal reservations. Therefore, EPA would be involved in development of the natural criteria in the context of NPDES permits in Idaho, Alaska, and on tribal reservations. If used as a basis for an NPDES permit in Oregon or Washington, EPA's oversight authority in those states provides for Agency review of the natural condition-based criteria application.

3. Implementation Plan Components

We suggest that states and tribes develop written procedures or guidance which will be used when determining the natural condition of a water body. These written procedures, or implementation plans, will facilitate consistent application of natural condition provisions. For the narrative criteria approach described above, the plan does not need to be formally adopted into the WQS. For the performance-based approach, the methodology would be adopted or referenced in state/tribal WQS regulations.

We encourage states and tribes to work with EPA in developing a technically sound Implementation Plan. At a minimum, we recommend the Plan (or procedures) that the state or tribe will use in determining natural condition criteria include the following:

- Information needed for a natural condition determination (e.g., What are the method and scientific basis the state or tribe uses to determine natural conditions and what information is needed to do so?),
- Questions to be answered (What questions will the state or tribe seek to answer? Some examples of questions include: How would using the natural condition provision in the WQS result in fully protecting the existing uses of the water body? Will the designated uses be protected? Where will the natural condition provision apply?),
- Public participation process, and
- System for tracking water quality criterion changes.

When applying the WQS natural condition provisions, we recommend that the state or tribe include the following information for each natural condition determination:

- Current beneficial uses and water quality criteria applicable to the water body,
- Explanation or demonstration of how using the natural condition provision in the WQS would result in fully protecting the existing and designated uses of the water body,
- Reason for proposing to use the natural condition provision,
- A demonstration that the exceedance is due to only naturally occurring conditions,
- The scientific basis used to determine the natural condition criterion (see section "How is Natural Condition Determined?" for further discussion on procedures),
- The methodology used in the derivation of the numeric value along with an analysis of the uncertainty associated with the estimate of the natural

- concentrations or levels,
- Land use history of the area where the natural condition criterion will apply (including industrial uses, land changes, etc),
- A description or inventory of the aquatic life in the water body and any endangered species which may be affected,
- Boundaries where the natural condition criterion will apply,
- Basis for conclusion that the site is not degraded by human impacts,
- Basis for selecting the reference location to develop a natural condition criterion (i.e., show that the reference location is not impacted or is minimally impacted and that the reference location is similar chemically, biologically, and physically to the site where the natural condition criterion will apply), and
- Documentation that the natural condition criterion does not adversely affect endangered species.

This information could be incorporated in a supporting document which would accompany each natural condition application. For instance, it could be included in the technical justification in support of a site-specific criterion, or the supporting documentation for a TMDL or in the fact sheet for an NPDES permit.

EPA will coordinate and, when appropriate, consult with federally recognized Indian Tribes and with N.O.A.A.-Fisheries and U.S. Fish and Wildlife Service, as part of the process of reviewing the state or tribe's proposed implementation plan.

4. Public Participation and Consultation Requirements

Prior to selection and establishment of any of the three recommended approaches, we recommend that the state or tribe clearly define the procedure to be used to notify the public and other potentially impacted parties. Public notification, review and opportunity for comment could occur at the same time as the existing public review opportunity associated with the applicable action, such the state or tribal water quality standards triennial review, 303(d) listing, TMDL development or NPDES permitting action.

The state or tribe ensures that the public notice includes either all relevant information or a summary of it. This would include a description of the basis for the natural conditions determination, a description of how it was determined that the condition is truly a naturally occurring condition, the technical rationale, the methodology used in deriving the numeric value, and the data used to estimate/derive the natural based criterion. Finally the state or tribe makes sure all applicable information is available upon request as well as provide the public with the opportunity to submit relevant data during the public notice period.

If a state's proposed site-specific criterion potentially impacts tribal waters and/or reservations and/or tribal resources, the state ensures that the affected tribes are provided the opportunity to provide data, input and comments on the proposal.

EPA coordinates and, when appropriate, consults with potentially affected federally recognized Indian Tribes as part of the process of reviewing and/or approving the

state's process, implementation plan or actual application of the natural condition-based criterion.

As appropriate, EPA also coordinates and consults under Section 7 of the Endangered Species Act (ESA) if federally listed species are likely to be affected by the application of the state or tribal approach to natural condition-based criteria.

C. Other Issues to Consider

We recommend the following issues be considered during the development of state and tribal WQS and/or Implementation Plan:

Measurable Change and Cumulative Impacts

Some states and tribes have incorporated the concept of measurability in their definition of natural condition and refer to “no measurable change” due to human sources. “Measurable change,” when equated with analytical detection limits becomes an allowance for a certain negligible increase over or change from the actual natural condition. Similarly, Oregon has adopted a human use allowance that allows a negligible increase above the natural condition due to human sources. Several states allow a small increase over the natural condition for a specific parameter:

- 0.2 mg/l below natural for dissolved oxygen (Washington);
- 0.3 degrees C over natural temperature and 0.1 mg/l below natural for dissolved oxygen from one source, and 0.2 mg./l below natural for all sources of dissolved oxygen (Oregon);
- 0.3 degrees C over natural temperature (Idaho).

The term “measurable change” is often used to describe two distinct concepts – analytical laboratory measurement sensitivity and negligible pollutant increases that are deemed ecologically insignificant. The state or tribe should ensure that clarification is provided when including terms such as “measurable change” or “no measureable change” in the definition of natural condition.

It is important for the state or tribe to carefully assess and determine how cumulative impacts are to be addressed in the context of a natural conditions determination. Cumulative impacts need to be considered when states or tribes provide for the allowance of small or insignificant additions to the naturally occurring level. The primary concern with respect to individual insignificant allowable contributions is that the additive effects of these amounts have the potential to accumulate and become a “significant” amount, thereby, no longer constituting a small or ecologically insignificant addition. It is useful for the state or tribe to have a mechanism to track the use of this allowance.

Attainability/Protection of Existing and Designated Aquatic Life Uses

Criteria which are based on truly natural conditions (*i.e.*, conditions absent human impacts) inherently protect the aquatic life uses that have “naturally” existed in the waterbody. The essential rationale for this is that the naturally occurring aquatic life uses, by definition, were supported by the water in its natural condition, prior to any human effects on water quality.

In all surface waters where there is an absence of human impacts, naturally occurring pollutants at levels that naturally occur are protective of the existing beneficial uses in that water body. While the state or tribal designated use may in fact reflect the existing uses, in some cases, the state or tribe may have designated a use for a particular water body that is not reflective of the existing “natural” use. In those cases the natural condition criteria may not be protective of the designated use. In those cases the state or tribe would need to re-evaluate the designated use and perhaps revise it in order to accurately reflect the attainable and existing “natural” use.

If the natural levels of a pollutant preclude the attainment of the designated use which was established by state or tribe prior to the natural criterion, a Use Attainability Analysis (UAA) provides a mechanism for removing or downgrading the designated use. The state or tribe would then establish a use or sub-category of a use which is attainable under the natural condition. A use that is an existing use (i.e., one that was actually attained at any time on or after November 28, 1975 (40 CFR 131.2(e)) must be protected and can not be removed.

See Appendix C for information on the water quality standards regulations related to UAAs. Also see *EPA Region 10 Temperature Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* for further discussion in relation to subcategories of salmonid uses and temperature criteria (see page 36) (USEPA, 2003).

Waters Designated for the Protection of Human Health

When applying a natural condition based criterion to state or tribal waters, it is important that a state or tribe evaluate the protection of the designated human health uses (e.g., drinking water, primary and or secondary contact recreation). This evaluation is of particular significance because human health criteria are based on human health risk assessments, which include such elements as exposure pathways, state and tribally adopted risk levels, carcinogenicity, and systemic toxicity. These elements and considerations are not components in establishing naturally occurring levels of a naturally occurring pollutant.

All states and tribes in Region 10 have designated all waters as protected for some form of recreation. Therefore, when a state or tribe proposes the application of a natural condition-based criterion to a specific water, the state or tribe would include an evaluation of whether or not the human health uses continue to be attained and protected by the natural condition based numeric criterion. Based on the results of this evaluation, the state or tribe would determine that the human health use is still protected by the natural condition-based criteria and therefore attainable, or if not, re-evaluate and possibly remove the recreation/human health use designation.

CWA §303(d) Listing Program and Natural Condition

A. About the 303(d) List

CWA Section 303(d) requires states¹ to create a list of water quality limited segments within their jurisdiction for which technology-based effluent limitations and other pollution control requirements are not stringent enough to meet applicable water quality standards (WQS). This list is required every two years. The purpose of the 303(d) list is to ensure that pollutant-caused water quality impairments are identified. States and tribes are then required to develop a plan for water quality improvements for each water body on the 303(d) list. Usually this is done through the Total Maximum Daily Load (TMDL) process. However, it is possible that the water body segment is removed from the 303(d) list for a “good cause” before the TMDL is developed. EPA regulations describe a few possible “good causes,” including data showing that the water body segment meets WQS or that a flaw was found in the original analysis.

Data Collection

States usually collect and analyze data and provide the public an opportunity to submit data. Following data analysis, states develop and put a draft list and/or draft list methodology out for public comment. The listing methodology describes how water quality criteria attainment and listing decisions will be made based on assessments and available data. We recommend that the states have a monitoring strategy guiding how, where and when to evaluate water bodies to determine whether they are attaining or not attaining water quality criteria. The TMDL process provides an opportunity for more in-depth data collection, analysis and pollutant-reduction planning.

Public Involvement and Participation

States then provide an opportunity for public comment on the draft 303(d) lists. When using a natural conditions provision during the 303(d) listing process, states clearly identify that a natural condition criterion is being used and allow an opportunity for public comment.

Role of the Tribes on State 303(d) Lists

States provide tribes with the opportunity to provide data, input and comments on the list, especially with respect to state proposed 303(d) listings that may potentially impact tribal waters, reservation lands and/or tribal resources that are outside of reservation boundaries.

As trustee, EPA watches for potential impact to tribal waters and resources during review of draft and final lists. EPA communicates with potentially affected tribes during review and preparation of comments on draft 303(d) lists and may request that the tribes prepare comments or request assistance in accurately reflecting the tribal concerns.

Final Approval

After states develop the final 303(d) list and their "responsiveness summary" addressing

¹ States are the primary entity that develops 303(d) lists and TMDLs. Tribes with EPA approved water quality standards in place may apply for TAS specifically for the authority to develop 303(d) lists and TMDLs. As of the date of this document, no tribe has applied for authority to create its own 303(d) list or develop TMDLs.

comments received during the public comment period, states submit the final 303(d) list to EPA for approval. The list methodology and documentation are usually submitted to EPA with the final list, although EPA does not approve the list methodology. EPA reviews and formally approves, partially approves, or fully disapproves the final list for each state.

B. Impact of Natural Condition Provisions on 303(d) Listing Decisions

The natural condition provisions in a state's WQS may determine whether water bodies and pollutants are listed, not listed, or removed from a state's 303(d) list, and the timing of the listing. EPA reviews and takes action on any decision whether to include or remove a water body and pollutant from the 303(d) list.

Described below are two potential 303(d) listing scenarios:

Scenario 1: A waterbody with a specific pollutant is on the state's 303(d) list. The state believes that the pollutant in that waterbody exceeds the numeric water quality criterion for that pollutant due to natural conditions. ***When that state's WQS require rule-making before a criterion can be adjusted to reflect natural conditions, then the water body with that pollutant continues to be on the state's 303(d) list while the formal rule-making is in progress.*** When the process is complete, the state may propose to remove the water body during the next list cycle.

Scenario 2: A waterbody with a specific pollutant is on the state's 303(d) list. The state believes that the pollutant in that waterbody exceeds the numeric water quality criterion for that pollutant due to natural conditions. ***When the state's WQS allow the natural condition to become the criterion without a formal change to the WQS*** (as in the performance-based natural condition provision or the automatic provision through a narrative WQS criterion approaches), ***then the state may propose to remove the water body with that pollutant during the next list cycle without undergoing any formal rule-making process.*** Furthermore, the state may not need to establish a numeric criterion reflecting the natural condition prior to removing a water body and pollutant from the 303(d) list.

C. Documentation for a Natural Condition Demonstration

Even with an automatic provision through a narrative natural condition WQS criterion, a state still needs to identify those water bodies and pollutants proposed for removal from the 303(d) list in the documentation supporting its 303(d) list. The state also needs to document its site-specific, scientifically based rationale demonstrating that the conditions are natural for each water body proposed for removal. This technical basis constitutes "good cause" for de-listing or not listing a water body. The state then submits this supporting documentation with its final 303(d) list packages to EPA.

EPA expects cases of not listing or removal from the list due to natural conditions during the 303(d) listing process to be infrequent. The amount of data and analysis available at the time of listing may not be adequate to demonstrate that natural conditions are the cause of numeric criteria exceedances, especially when there are confounding anthropogenic effects. Often the more extensive analysis and data collection to make the natural condition demonstration are done during the water quality assessment phase of TMDL development.

When using the natural condition provision, the state would submit supporting documentation, along with the formal submittal of its 303(d) list to EPA. We encourage states to work with EPA staff prior to submittal to ensure documentation is sufficient to support the action. See “Implementation Plan” on pages 7-8 for information to include.

Format for Documentation

There are several format options for a state to document and describe its rationale for not listing the water on the basis of natural condition, including:

- providing information on the “Supporting Information/Data” column in the state's 303(d)/305(b) Integrated Report,
- providing a summary of the rationale to EPA via e-mail, fax or letter,
- explaining the rationale in the "response to comments" document, and/or
- developing papers to support the state's rationale on how conditions are natural (showing that decisions made were consistent with CWA and approved WQS).

We recommend that the state maintain an administrative record for listing decisions, and keep the supporting data and information readily available in that record.

Additional Recommendations

Listing decisions are based on *existing* and *readily available* data and information.

Listing decisions are justified with a *site-specific, scientifically defensible rationale* that does one of the following:

- ***Explain why human activities in a watershed are not directly or indirectly the cause of the exceedance of WQS for the pollutant of concern***
When developing the documentation, we recommend that the state or tribe focus on the amount of human activity that has taken place near the site that is being evaluated. Explain why those activities do not directly or indirectly affect the water quality parameters of concern. Describe the physical extent, duration, and intensity of human activity as quantitatively as possible.
- ***Show that there has been minimal human activity in the watershed that would affect the water quality parameter in question***
Explain that either there has been no human activity, the activity has been minimal and did not impact water quality, or both the activity and its impacts are no longer present, are not expected to recur and no longer affect the watershed.
- ***Explain how natural processes alone are adequate to explain the observed exceedance of the water quality standard for the pollutant of concern.***
Present a scientifically justifiable rationale that demonstrates that natural processes alone adequately account for the criterion exceedance. In the rationale, include a discussion of the major factors that are known to affect the parameter of interest.
- ***Show that the water quality in the watershed is similar to that measured in an undisturbed or minimally disturbed reference location.***
In some situations, comparison to another location is the best available means to evaluate natural conditions. A case can be made that the water quality in the watershed is similar to that measured in an appropriate undisturbed or minimally

disturbed reference location. Documentation of adequate similarity is important. This option is often preferred in instances when historical data are not available.

For each of the above approaches, include appropriate references to the scientific literature and/or data. See Section “Determining Natural Conditions” for further information on developing the justification.

TMDL Program and Natural Condition

A. About TMDLs

Defining TMDLs

A Total Maximum Daily Load (TMDL) is a "pollutant-specific budget" for a polluted water body, that provides a written assessment of water quality problems, identifies the pollutant sources that contribute to the problems, and sets pollutant allocations for these sources. A TMDL is required by the federal CWA for any water body that does not meet the state's WQS for a specific pollutant. EPA approves TMDLs that are usually developed by states. EPA coordinates and, when appropriate, consults with potentially affected federally recognized tribes as part of the process of reviewing states' TMDL packages. Usually these water bodies, along with the pollutant, have been identified on the state's 303(d) list (see 303(d) section for additional information). A TMDL clearly identifies the links between the water body use impairment or threat of concern, the causes of the impairment or threat, and the pollutant reductions that are needed for the water body to meet the state's WQS for that pollutant.

The TMDL provides an analytical basis for planning and implementing pollution controls, land-management practices, and restoration projects needed to protect water quality. Implementation actions may be accomplished through voluntary efforts, or through regulatory programs such as National Pollutant Discharge Elimination System (NPDES) permits or Superfund.

Role of Tribes in the Development of TMDLs

EPA coordinates and, when appropriate, consults with federally recognized tribes as part of the process of developing and/or reviewing TMDLs that may impact tribal reservations and/or tribal resources that are outside of Indian reservation boundaries (including treaty-protected "usual and accustomed" hunting and fishing areas and subsistence areas under state and federal jurisdiction). In waters that form the state and tribal boundaries, EPA, the tribe and the state will often develop TMDLs jointly.

The majority of EPA TMDL decisions are approval of state-issued TMDLs. Therefore, we encourage tribal and state TMDL developers to work closely together to ensure that tribal interests are heard and addressed. We recommend early tribal involvement in state-led efforts to develop TMDLs. The tribe can provide its own knowledge, data and information as well as its perspective on these state-led efforts.

Every year EPA has an annual planning process with states to identify the TMDLs that will be developed in the upcoming year. EPA works with the tribes to identify TMDL actions in which they would like to be involved.

We recommend that the tribes actively participate during public comment periods during TMDL development. We recommend that the tribes check the state's website regularly for announcements concerning the public comment periods for draft water quality assessments and TMDLs.

For additional information, review "U.S. Environmental Protection Agency Tribal Coordination and Consultation Policy for the TMDL Program" (March 2002) on EPA's website under www.epa.gov/r10earth/tmdl.htm.

Components of a TMDL

The TMDL document includes the following elements:

Problem Statement: A description of the water body/watershed setting, beneficial use impairments of concern, and pollutants or stressors causing the impairment

Numeric Target(s): For each stressor addressed in the TMDL, appropriate measurable indicators and associated numeric target(s) based on numeric or narrative water quality criteria that express the target or desired condition for protecting the designated beneficial uses of water.

Source Analysis: An assessment of relative contributions of pollutant or stressor sources or causes to the use impairment and the extent of needed discharge reductions/controls.

Loading Capacity Estimate: An estimate of the assimilative capacity of the water body for the pollutant(s) of concern.

Allocations: Allocation of allowable loads or load reductions among different sources of concern, including an adequate margin of safety. These allocations are usually expressed as wasteload allocations to point sources and load allocations to nonpoint sources. Allocations can be expressed in terms of mass loads or other appropriate measures. The TMDL equals the sum of allocations and cannot exceed the loading capacity. In an equation, a TMDL = Load Allocations (including natural background) + Wasteload Allocations + Margin of Safety.

B. When to Consider Utilizing the Natural Conditions Provision

There are a number of points during the development of the TMDL where the state may find it appropriate to evaluate one of the natural provisions. These include:

During the Development of the Water body Assessment:

When the state finds new information or data that indicates that the 303(d) listed pollutant/water body exceeds WQS due to natural conditions, the natural condition provision may be the appropriate WQS. If the natural condition alone exceeds the criterion and there are no further pollutant sources, the water body and pollutant may be removed from the 303(d) list or a site specific criterion developed (for additional information, see "WQS Approaches to Natural Condition" and/or "303(d) Listing and Natural Conditions").

When Sources Have Been Eliminated

If all anthropogenic sources of the pollutant no longer contribute directly or indirectly to the exceedance of the pollutant in a water body yet the water quality criterion is still exceeded, the state may use the natural condition provisions of its WQS. The natural condition may be used to remove the water body and pollutant from the 303(d) list or to develop a site-specific criterion for the pollutant in that water body (for additional information, see

“WQS Approaches to Natural Condition” and/or “303(d) Listing and Natural Conditions”).

C. When to Calculate Natural Condition

There are several instances where the natural condition may need to be calculated as part of developing a TMDL.

When Determining Natural Background

The TMDL is a sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources and the pollutant’s natural contribution, and an appropriate margin of safety. Thus for some TMDLs, it may be necessary to calculate the portion of the load generated from natural sources and address that load through a load allocation to natural background.

When Establishing the Natural Condition as a TMDL Target

When the “natural condition” of a water body exceeds the applicable water quality criterion and the state or tribal WQS natural condition provision allows the natural condition to become the criterion, the natural condition also can become the TMDL target. In this case, the natural condition usually is quantified. Once quantified, the natural condition or target is used to calculate the loading capacity and any allowable loading.

When the WQS Criterion includes an Allowance over Natural Background

Some water quality criteria allow for a specified increase over natural background (i.e., temperature of 0.3°C above the natural condition when the "natural condition" of a water body exceeds the applicable numeric criterion). When these conditions are applied, the natural condition may need to be quantified in order to develop the TMDL target, load capacity and allocations.

When Translating a Narrative WQS Criterion for Development of a TMDL Target

A narrative WQS criterion may need to be translated into a numeric TMDL target in order to develop TMDL load capacity and allocations. In the case where natural background is a key component of the numeric TMDL target or in situations where natural background levels are being used as the TMDL target, the natural background may need to be quantified in order to develop the TMDL.

Additional information on calculating natural conditions is provided in the Section VI “Determining Natural Conditions.”

D. Factors to Consider When Determining Amount of Data or Complexity of Analysis

TMDLs, including the quantification of natural sources, are usually based on readily available information and studies. In some cases, the development of the TMDL may need to be delayed until additional data are collected. While simple analytical efforts can provide an adequate basis in some cases, other situations will require complex studies or models to understand how stressors are impacting the water body and to develop load and wasteload allocations.

In determining whether additional studies or information are needed, all existing data should be assembled and analyzed to determine the type of analysis that it may support. As part of

this analysis, data gaps should be identified. We recommend that the state discuss its preliminary approach or determination with appropriate EPA staff.

In evaluating the complexity of the analysis required and whether additional data are needed, We recommend considering the following factors:

- ***Type and quantity of data*** and the ***analysis tools currently available***
- ***Level of risk*** associated with proceeding with currently available data
- ***Legal deadlines*** or agreements for completing the TMDL
- ***The TMDL implementation mechanism and the ability of planned implementation to be adjusted over time.*** In situations where actions can be readily adapted based on new information or where actions can be iterative, rapid implementation may be more important than complete analysis in advance of taking actions. In contrast, in situations where a prospective action could be irreversible or nearly so (such as major construction required as part of the watershed recovery project), a more rigorous analysis may be desired, with sufficient data to feel confident about the accuracy of the TMDL analysis and its conclusions.
- ***Whether the human impact is caused by point or non-point sources.*** If the water body receives all its human impacts from non-point source activities, there may be more flexibility in the amount of data and the type of analyses that are required, especially where adaptive management will be used.
- In many cases, widespread and/or long-term human land uses are the source of the problem and ***long-term solutions*** will be required to repair them. Long-term solutions will require continued refinement of targets and continued monitoring to evaluate effectiveness of pollution reduction plans. In these cases, it may not be necessary to have a high degree of certainty in the absolute numbers that are used to estimate the natural condition.
- In the case of water bodies with ***point sources***, quantification of the natural condition is needed for incorporation into NPDES permit limits. In such cases, a more rigorous analysis that significantly reduces uncertainty may be needed.

E. Additional Information to Support the Use of a Natural Condition within a TMDL

In addition to the information listed in the section on Implementation Plan Components on pages 7-8, we recommend that the following information also be included in any TMDL document that incorporates the natural condition of a water body into its analysis and/or makes any natural condition calculations:

- The water quality criterion used in the TMDL: If the criterion is narrative, how is the criterion being interpreted?

- The definition used for natural condition; how is the natural condition being calculated or demonstrated (including rigor of the demonstration) for the TMDL target, capacity and allocations?
- If a reference condition is being used, comparison between that water body or reference site and the area addressed in the TMDL.
- The kind of data, information, analysis, monitoring and rationale being used.

For EPA's recommendations with respect specific issues related to natural condition determinations for temperature, particularly with respect to natural temperature variability and cold water refugia, see *EPA Region 10 Temperature Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (see pages 37 -39) (USEPA, 2003).

NPDES Program and Natural Condition

A. Water Quality-based effluent limits and NPDES permits

Permit writers consider the impact of surface water discharges on the quality of the receiving water. By analyzing the effect of a discharge on the receiving water, the permit writer determines whether water quality-based effluent limits need to be included in a NPDES permit in order to protect the water quality goals of the water body (see “WQS Approaches to Natural Condition” for additional information). These limits are designed to protect the quality of the receiving water by ensuring that the state or tribal WQS are met in the vicinity of the permitted discharge.

Controlling pollutant discharges to receiving waters involves using the pollutant-specific criteria, which are adopted into a state or tribal WQS for the protection of aquatic life and human health. The criteria are used as a basis to analyze the effluent and receiving water, decide which pollutants need controls, and derive water quality-based effluent limits that will control those pollutants to the extent necessary to achieve water quality standards in the receiving water. This approach allows for the control of individual pollutants before a water quality impact has occurred or to assist in returning water quality to a level that will meet designated uses.

B. Using the Natural Condition Provision in an NPDES Permit

States and tribes have adopted designated uses and numeric criteria for each of their water bodies. The NPDES regulations require NPDES permits to protect all designated uses of a water body by ensuring that the applicable criteria are met within the water body. When a state or tribe has a natural condition provision within its WQS, the adopted criterion used to make permitting decisions may be changed to reflect the natural condition of the water body provided the natural condition fully protects the designated uses of the water body. We recommend that states and tribes follow the steps and procedures outlined in the “Implementation Plan” (page 7) prior to using the natural condition criterion to develop NPDES permits or to make permitting decisions. The following elements are especially important for the NPDES permit development process.

- A description of the scientific basis used to determine the natural condition.
- Demonstration that the criterion based on the natural condition provision will be protective of uses.²
- A description of where the natural conditions will apply (boundaries)
- Public participation process

Additionally, we recommend that states coordinate closely with tribes when using the natural conditions provisions to ensure that the natural condition determination does not already impact tribal waters, reservation lands and/or tribal resources that are outside of reservation boundaries.

²If the natural levels of a pollutant preclude the attainment of the designated use which was established by state or tribe prior to the natural criterion, a Use Attainability Analysis (UAA) provides a mechanism for removing or downgrading the designated use.

C. Natural Condition Provisions and Mixing Zones

A mixing zone is a limited area or volume of water where dilution of a discharge takes place and where numeric water quality criteria can be exceeded provided that:

- there are no lethal effects to organisms in the mixing zone,
- there are no significant risks to human health, and
- the designated and existing uses of the water body as a whole are not impaired as a result of the mixing zone.

Mixing zones are generally not authorized in NPDES permits unless the receiving water concentration of a pollutant is below the applicable criterion. The NPDES permitting regulations at 122.44(d) allow the use of dilution, “where appropriate,” when making permitting decisions.

Determining whether dilution is “appropriate” entails two analyses: the first legal and the second technical. Legally, dilution may be considered if allowed under the state or tribal WQS. Technically, dilution may be considered if the receiving waters actually have the capacity to dilute the effluent to levels at or below the applicable water quality objective or criterion.

If dilution is allowed, the WQS are to be met at the edge of the authorized mixing zone. If the receiving water is at the applicable standard objective or criterion (as it would be if the natural condition of the water body is used as the standard objective), and the effluent is greater than the applicable standard objective or criterion, it is mathematically impossible for the applicable criterion to be met at the edge of the mixing zone, because there is no dilution capacity available. Therefore, it would be unlikely that a mixing zone could be granted in a water body where the natural condition served as the criterion.

However, in situations where the WQS has a provision that allows an increase above natural background or natural conditions (such as temperature WQS in Oregon and Washington) and there is assimilative capacity in the water body, it may be appropriate for an NPDES permit to include a mixing zone. See *EPA Region 10 Temperature Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* for EPA Region 10's policy with respect to alternatives to numeric criteria end-of-pipe temperature limits for NPDES sources in temperature impaired waterbodies (see pages 42-44) (USEPA, 2003).

Determining Natural Conditions

There is no single correct approach to determine a natural condition. However, there are two fundamental approaches used to quantify a natural condition: measurement and modeling. The approaches may be used separately or in conjunction with one another. The distinction between the two is not absolute: the measurement approach uses a statistical model to derive an estimate of the natural condition and the modeling approach relies upon measurements, as well as equations that represent the key relationships among system components.

Common Aspects of Both Approaches

With the exception of the few cases that use pre-development data, both approaches rely upon comparison of the water body in question, or the assessment water body, with a hypothetical natural condition for that water body. Both approaches derive estimates of the hypothetical condition, and both approaches contain inherent uncertainties. Neither is guaranteed to be more or less environmentally protective than the other.

A. The Measurement Approach

In some cases, a natural condition can be estimated using historical data or information from a pre-development condition. This is relatively uncommon, except in cases of proposed projects in undeveloped areas. Most commonly, natural condition is determined by comparing in-stream data to data from a reference water body that has similar physical and geographical characteristics.

The term “reference” is discussed further in Appendix E. An ideal reference condition describes the physical, chemical, and biological characteristics of a water body in the absence of any human disturbance and pollution. It is important to distinguish between a reference condition and a reference site. A reference site is an actual location from which physical, chemical and biological data are accepted as being representative of the ideal reference condition. A reference location may be appropriate for a particular parameter or project but may not represent a reference condition for all parameters or projects.

Using Data from Reference Locations

When comparing data from a potentially impaired assessment site to a reference condition, the selection of an appropriate reference site is a critical aspect of the analysis. In order to be an acceptable location, a reference site should be demonstrably similar and relatively undisturbed by human activities. The reference site needs to be similar to the impaired site in its essential chemical, physical and biological characteristics. For use in a natural conditions determination, a reference site needs to have experienced minimal disturbance from human activities and should have a similar natural disturbance regime to that expected in the assessment watershed.

Recommended Information Using Measured-Data Approach

When making a natural condition determination with data from a historical or pre-development condition or from a reference site, we recommend the following information be provided:

- Describe the amount and quality of the data to be used to estimate natural condition;
- Demonstrate that the data are of adequate quality and quantity, with the appropriate level of QA/QC;

- Describe the statistical treatment of the data and the rationale for its selection, including the handling of values less than the detection limit;
- Justify the statistical treatment of the data. Demonstrate that the statistical approach is appropriate to the characteristics of the data set, is appropriate to its distribution and is environmentally protective;
- Document that data were collected during the appropriate time period to evaluate the parameter of concern;
- Specify the averaging period and why it is appropriate to the parameter of concern;
- Describe the amount of natural variability to be expected, and how it was taken into account in the analysis.

Selecting Reference Sites For a Natural Condition Determination

The selection of appropriate reference sites with minimal human disturbance is one of the primary challenges. The ideal reference site is very similar to the site being evaluated, has little or no human disturbance, and abundant high-quality data. This combination is rare.

It is difficult to find locations that are natural and without some level of human impact. More commonly, sites have both natural and human-caused impacts to water. In the absence of a "natural" reference site, it may be necessary to use a reference site that is minimally impacted. The allowable level of impact for this reference condition should be very small if it is to be a credible estimate of the "natural condition."

For example, allowing a minimal level of impact for a reference location may be most appropriate when the parameter that naturally exceeds the criterion, such as a metal in the dissolved state, is not affected by whatever minimal disturbance may exist in the watershed (such as some removal of trees).

Recommendations for Documenting the Appropriateness of a Reference Location

When documenting the appropriateness of a reference site to make a natural condition determination at an assessment location, we recommend providing the following information:

- Demonstrate that the proposed reference location and the assessment location are comparable (see Appendix E for definitions of the various types of reference conditions).
- Document the similarity between the locations on the basis of the following: geographic proximity, elevation, climate, watershed size, timing and quantity of flow and other factors relevant to the parameter of concern, such as erosion potential.
- Describe the extent and degree of human impacts as quantitatively as possible
- Describe the amount of natural disturbance as quantitatively as possible
- Explain the relationship between the disturbances and the parameter of concern
- Demonstrate that the proposed reference watershed has been minimally affected by human activities, and that the level of natural disturbance is comparable to what would be expected in the assessment watershed in the absence of human activity.
- Demonstrate that the existing level of disturbance would not be expected to significantly impact the parameter of concern.

B. The Modeling Approach

The term “model,” as used in this document, is a technique for predicting a condition in a specific place in the environment. A water quality model is a mathematical tool used to estimate water quality conditions of water bodies under a specific set of environmental conditions. Models are used to allocate pollutant loads, evaluate management practices and understand the basic mechanisms that transport water and pollutants through a watershed. Models allow the user to understand pollutant contributions from different sources, understand cumulative downstream impacts from various sources, perform “what if” scenarios using different assumptions, set TMDL allocations, and estimate “natural” conditions. EPA's Council on Regulatory Environmental Modeling (CREM) has issued draft guidance on the practice of environmental modeling (USEPA, 2003a).

Confidence in a model's results is tied to the accuracy of its prediction of the existing condition. However, modeling accuracy is also determined by the “theoretical constructs” of the assumptions contained in the model. These are based upon prior observations drawn from field and laboratory data and relate the external forces acting upon the system to the observed or anticipated responses.

One limitation of the modeling approach is that the effects of any unknown or poorly understood human-caused sources may be excluded from the model. This can result in human impacts being erroneously attributed to the natural condition.

Selecting the Model

When using modeling to estimate a natural condition, it is essential to provide the rationale for the selection of both the modeling approach and the particular model used in the evaluation. The model should be appropriate for the objectives of the analysis and for the characteristics of the water body being assessed as well as for the parameter being estimated. The mathematical model should be clearly and logically tied to a conceptual model that describes the important characteristics of the system and is consistent with scientific theory.

One of the major challenges in modeling a natural condition is that modeling can be resource-intensive in terms of staff time and data needs. Another challenge is selecting a model that is appropriate to the type of questions being asked and the scale of the analysis required.

Two methods have been commonly used for water quality modeling in the United States over the last 20 years: 1) statistical models, which are based on observed relationships between variables and are often used in conjunction with measurements from a reference location and 2) simulation or process-based models which attempt to quantify the natural processes acting on the water body. These are often employed when no suitable reference locations can be identified. Both types of models use equations to represent the key relationships among system components, but the ways they derive those equations are different.

Statistical Models

Statistical models, also referred to as empirical models, use measurements from actual locations to describe relationships using statistical techniques such as correlations. The equations describe the observed relationships in the variables as they were measured in those specific locations. The question regarding how far it is appropriate to generalize from the measured locations to other water bodies is of fundamental importance and should be considered when using statistical models.

Advantages and Limitations of Statistical Models

Statistical models have the advantage of being relatively simple, as they rely on general data and statistics to develop correlations. In the case of modeling a natural condition, the correlations would be between a parameter of interest and the landscape characteristics that control that parameter. It is important to remember that correlations in themselves are not direct indications of cause and effect. The cause and effect relationships can be inferred from linking the statistical model back to a conceptual model that describes the known relationships between the important processes affecting the parameter of interest.

Some of the challenges involved in using statistical models are identical to those described above for selecting reference locations. The comparability between the reference location and the assessment location strongly affects the model results. Uncertainties in statistical model results increase with increasing dissimilarity between the landscape characteristics of the reference location and assessment location. Uncertainties also increase when models do not include landscape characteristics that control important processes affecting the parameter of concern in the assessment location. Projects that use statistical models to estimate natural condition should describe the effects these uncertainties can have on the resulting estimates.

Simulation or Process Models

Natural conditions can also be estimated using a simulation modeling approach, which may also be referred to as process modeling, numeric modeling, deterministic modeling, or mechanistic modeling.

Estimating water quality under natural conditions using a mathematical model is generally a two-step process. The first step is to simulate the existing condition and estimate model parameters based on comparisons between measurements and model estimates for the pollutant in question. The second step is to remove the model inputs that represent the human-caused sources of the pollutant from the model of the existing condition. The resulting model is a representation of natural condition.

Process models are based on theoretical relationships among the factors that determine water quality for a particular parameter. They are mathematical characterizations of the current scientific understanding of the critical processes that affect water quality. The equations are constructed to represent the observed or expected relationships and are generally based on physical or chemical principles (e.g., conservation of mass) that govern the fate and transport of the pollutant. For some physical or chemical processes, input parameters (such as rates and constants) used in the equations are estimated using prior observations of the system or from other systems that behave similarly.

In recent years, increases in computer processing power have led to the development of distributed process models, which incorporate a high degree of spatial resolution. These models use Geographical Information Systems (GIS), remotely sensed data, and site-specific data to vary the model's input parameters at different locations in the water body or the landscape.

In addition to documentation that the model is appropriate to support the objectives of the analysis and for the characteristics of the stream being assessed, other aspects of process modeling that must be clearly articulated are the source of the input parameters and some evaluation of the source and magnitude of the uncertainties.

Advantages and Limitations of Process Models

Unlike statistical models, process models do not rely upon data from reference locations, so can be used for rivers and streams that have no suitable natural reference comparisons available. This is a common problem when estimating natural conditions for larger streams and rivers. However powerful, process models are by no means infallible. Errors can arise when there are locally important factors that the model does not address, or when there is a great deal of uncertainty in input parameters that strongly influence the model results.

Documenting Assumptions and Uncertainties

We recommend the statistical and/or numerical strengths and limitations of the model be disclosed in the analysis. No model can accurately represent the highly variable natural world, so simplifying assumptions must be made. Those assumptions need to be described along with the implications they have on the model results.

The model should be appropriate for the scale and type of stream being assessed, and there should be adequate data available to use for the model input parameters. In addition, it is important to document that the uncertainties in the estimate of the natural background condition are within a reasonable range for the decisions that are to be made based on the model results.

Documenting Input Parameters or Equivalent

For process models, the source of the input parameters needs to be explained. Clear distinction between inputs based on measurements and inputs based on indirect information is essential. Where inputs are based on indirect information such as assumptions or professional judgment, the rationale for their selection should be included. Where measurements are available, the spatial and temporal resolution of the data and the quality of the data should be appropriately matched to the model objectives.

While statistical models do not have "input parameters" in the same sense as process models, their results are strongly tied to the assumptions that are built into the model. These assumptions help determine which characteristics or factors to use to represent the environmental stressors and responses in the correlations, and which data sets to use to represent them. We recommend such decisions should be documented and linked to the conceptual model and to the model objectives in the same way as input parameters for process models.

Other Considerations When Describing Modeling Results

In addition to providing the rationale for the selection of the model and for the input parameters, there are additional aspects related to the evaluation of natural condition to address when describing model results. Since no model can include all processes that may affect water quality, we recommend the following questions be addressed when describing the model results:

- What factors or important processes does the model include?
- What factors or processes does it omit? Are the un-modeled factors likely to be significant?
- What input parameters have the strongest effect on the model results?
- What input parameters have the greatest and the least amounts of uncertainty?

C. Recommendations on Approaches to Determine Natural Condition

No approach to determining natural condition is inherently more accurate or more environmentally protective than another, so no single correct approach can be recommended. Each CWA program and each individual project have specific objectives, requirements and constraints. Site-specific characteristics and data availability are additional factors that should be taken into account when deciding which approach to use.

The method used to determine the natural condition will depend upon the amount and type of information available to support the conclusion that natural conditions exceed a water quality standard. We recommend that the state or tribe answer the following questions, as appropriate, prior to selecting a methodology:

- Does a suitable reference watershed or reference location (with similar size, elevation, geology, climate, fauna, flora, flow, etc.) exist?
- Are there adequate data from the reference location?
- Is there an appropriate model that meets the project objectives?
- Is there available expertise to run the model?
- Are there adequate data to use as model input parameters?
- What are the legal, resource and time constraints?

Modeling approaches can vary considerably in terms of complexity and resource demands including field data and staff time. When selecting the modeling approach, it is important that the scale of the modeling effort be tailored to fit the magnitude and the scope of the environmental risk associated with project decisions.

Regardless of the approach used to estimate natural condition, EPA expects to see natural condition justifications that are scientifically defensible and environmentally protective. We recommend that each justification be well-documented and that states and tribes use information that is adequate in both quality and quantity. We recommend that the analyses and the resulting estimates of the natural condition be accessible to the public.

An overview of methods to estimate natural conditions for temperature, similar to those methods discussed above, is included in *EPA Region 10 Temperature Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (see pages 39-41) (USEPA, 2003).

D. References

Hughes, R.M. (1995). Defining acceptable biological status by comparing with reference condition. In Davis, W.S. and T.P. Simon (editors). Biological assessment and criteria: tools for water resource planning. CRC Press, Boca Raton, Florida. 31-48 pp.

Idaho Department of Environmental Quality, (2004), Surface Water Monitoring Strategy.

Stoddard, J.L., P. Larsen, C.P. Hawkins, R.K. Johnson. 2004. Setting expectations for the ecological conditions of running waters: the concept of reference conditions. Ecological Applications (in review).

USEPA, (1996). Biological criteria: technical guidance for streams and small rivers. EPA 822-B-96-001. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA, (2003). Council on Regulatory Environmental Modeling (CREM), Draft Guidance on the Development, Evaluation and Application of Regulatory Environmental Models, November 2003.

USEPA, (2003). EPA Region 10 Guidance For Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. U.S. Environmental Protection Agency, Region 10 Office of Water, Seattle WA.

Appendices

- Appendix A Natural Condition Provision Language from R10 State and Tribal WQS
- Appendix B Performance-Based Approach
- Appendix C Use Attainability Analysis (UAA)
- Appendix D Terminology and Definitions
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Appendix A: Natural Condition Provision Language from EPA Region 10 State and Tribal WQS

States

Alaska

What Natural Condition Approach does Alaska use?

Alaska provides a site-specific criteria approach in that while Alaska may "administratively authorize" a natural condition-based SSC in a permit, certification, or approval, EPA reviews each natural condition SSC under EPA approval/disapproval duties under CWA section 303(c)(3). EPA reviews the data and rationale submitted with each natural condition SSC to determine whether the development of the criterion is scientifically defensible as required by 40 CFR 131.11(b)(1)(iii).

What is written in Alaska's Water Quality Standards?

"AAC 70.235. Site-specific Criteria. Alaska provides two approaches: (1) a site-specific criterion is developed when Alaska "administratively authorizes" changes to a water quality standard that reflects the natural condition through a performance-based approach, and 2) for some criteria a narrative approach is used in which the natural condition automatically becomes the criterion.

What is written in Alaska's Water Quality Standards?

"(a) The department will, in its discretion, establish a site-specific water quality criterion that modifies a water quality criterion set out in 18 AAC 70.020(b)

- (1) in a permit, certification, or approval as described in (b) of this section; or
- (2) in regulation as described in (c) of this section.

(b) If the department finds that the natural condition of a water body is demonstrated to be of lower quality than a water quality criterion set out in 18 AAC 70.020(b), the natural condition constitutes the applicable water quality criterion. Upon application or on its own initiative, the department will determine whether a natural condition should be approved as a site-specific water quality criterion. Before making the determination, the department will issue public notice of a proposed approval under this subsection and provide opportunity for public comment. If a natural condition varies with time, the natural condition will be determined to be the prevailing highest quality natural condition measured during an annual, seasonal, or shorter time period before discharge or operation, or as the actual natural condition measured concurrent with discharge or operation. The department will, if necessary to adequately protect water quality,

- (1) determine a natural condition for one or more seasonal or shorter periods to reflect variable ambient conditions; and
- (2) require additional or continuing monitoring of natural conditions as a condition of a permit, certification, or approval.

(c) Upon application, or on its own initiative, the department will, in its discretion, set site-specific criteria in regulation if the department finds that the evidence reasonably demonstrates that the site-specific criterion will fully protect designated uses in 18 AAC 70.020(b) and that

- (1) for reasons specific to a certain site, a criterion in 18 AAC 70.020(b) is more stringent or less stringent than necessary to ensure full protection of the corresponding use class; or
- (2) a criterion would be better expressed in terms different from those used in 18 AAC 70.020(b).

(d) The department will set a site-specific criterion under (c) of this section for the growth and propagation of fish, shellfish, other aquatic life, and wildlife use classes in 18 AAC 70.020(a)(1)(C)

and 18 AAC 70.020(a)(2)(C) only if the department finds that the evidence is sufficient to reasonably demonstrate that

(1) the species or habitats present, or expected to be present under natural conditions, are more sensitive or less sensitive to a substance than indicated by the criterion, and a site-specific criterion is required to prevent adverse effects or to alleviate an unnecessarily restrictive general criterion; or

(2) the natural characteristics of the receiving environment would increase or reduce the biological availability or the toxicity of a substance, or otherwise alter the substance, and a site-specific criterion is required to prevent adverse effects or to alleviate unnecessarily restrictive general criterion.

(e) An applicant seeking a site-specific criterion under this section shall provide all information that the department determines is necessary to modify an existing criterion. The department will, in a timely manner, request and review for completeness, information submitted under this subsection. In all cases, the burden of proof is on the applicant seeking a site-specific criterion. (Eff. 11/1/97, Register 143; am 4/29/99, Register 150)” (Water Quality Standards AAC 70.235. SITE-SPECIFIC CRITERIA.)

Does Alaska formally revise water quality standards when using its Natural Condition provision?

No. Site-specific criteria set for natural conditions do not involve a formal adoption of the criteria into Alaska WQS regulations. Alaska reviews and approves a natural condition as part of permits, certifications or other approvals, such as TMDLs and 303(d) listings, that also go through public participation and EPA approval. In addition, EPA reviews each natural condition SSC under EPA approval/disapproval duties under CWA section 303(c)(3). EPA reviews the data and rationale submitted with each natural condition SSC to determine whether the development of the criterion is scientifically defensible as required by 40 CFR 131.11(b)(1)(iii).

How is Alaska’s Natural Condition provision implemented: generally or site-specifically?

It is implemented on a site-specific basis as the need arises.

What are other unique attributes of Alaska’s approach?

Alaska does not go through a formal revision to its water quality standards regulations each time it implements its natural condition site specific criteria approach.

Idaho

What Natural Condition approach does Idaho currently use?

Narrative criteria approach where the natural condition automatically becomes the criterion.

What is written in Idaho's Water Quality Standards?

EPA approved the following language contained in Idaho's water quality standards regulations:

"200.09. Natural Background Conditions. When natural background conditions exceed any applicable water quality criteria set forth in sections 210, 250, 251, 252, or 253, the applicable water quality criteria shall not apply; instead, pollutant levels shall not exceed the natural background conditions, except that temperature levels may be increased above natural background conditions when allowed under Section 401(point source wastewater treatment requirements)."

Does Idaho formally revise water quality standards when invoking its Natural Condition provision?

No. Idaho does not go through a formal revision to its water quality standards each time it implements this approach.

How is Idaho's Natural Condition provision implemented : generally or site-specifically?

It is implemented on a site-specific basis as the need arises.

What are other unique attributes of Idaho's approach?

For purposes of listing, the State included the following provisions to make it clear that these natural background determinations have the effect of site-specific criteria, without being determined as such:

"053.03. Natural Conditions. There is no impairment of beneficial uses or violation of water quality standards where natural background conditions exceed any applicable water quality criteria as determined by the Department, and such natural background conditions shall not, alone, be the basis for placing a water body on the list of water quality-limited water bodies described in Section 054."

Additionally, Idaho developed an implementation guidance document which provides a discussion of the basic principles they will follow in implementing the narrative provision for addressing natural conditions.

How are natural condition determinations tracked?

Idaho will be tracking their natural conditions determinations within their assessment database. This database is the vehicle for tracking and reporting water quality status. This document is publicly available and can be found on IDEQ's website.

Oregon

What Natural Condition approach does Oregon use?

Narrative approach where the natural condition automatically becomes the criterion.

What is written in Oregon's Water Quality Standards?

OAR 340-041-0007(2) Where a less stringent natural condition of a water of the state exceeds the numeric criteria set out in this Division, the natural condition supersedes the numeric criteria and becomes the standard for that waterbody. However, there are special restrictions, described in OAR 340-041-0004(9)(a)(C)(iii) that may apply to discharges that affect dissolved oxygen.

Does Oregon formally revise water quality standards when invoking its Natural Condition provision?

No, Oregon does not go through a formal revision to its water quality standards each time it implements this approach.

How is Oregon's Natural Condition provision implemented: generally or site-specifically?

It is implemented on a site-specific basis as the need arises.

What are other unique attributes of Oregon's approach?

Oregon couples its automatic natural condition provision with a very limited allowance for some anthropogenic increase to the natural condition. Oregon allows the following increases:

Dissolved Oxygen. OAR 340-041-0004(9)(a)(D)(iii): "Effective July 1, 1996, in water bodies designated water-quality limited for dissolved oxygen, when establishing WLAs under a TMDL for water bodies meeting the conditions defined in this rule, the Department may at its discretion provide an allowance for WLAs calculated to result in no measurable reduction of dissolved oxygen. For this purpose, "no measurable reductions" is defined as no more than 0.10 mg/L for a single source and no more than 0.20 mg/L for all anthropogenic activities that influence the water quality limited segment. The allowance applies for surface water DO criteria and for Intergravel DO if a determination is made that the conditions are natural. The allowance for WLAs would apply only to surface water 30-day and seven-day means, and the IGDO action level;"

Temperature. OAR 340-041-0028 (8) Natural Conditions Criteria: Where the Department determines that the biologically based criteria in section (4) of this rule, the natural thermal potential temperatures supersede the biologically based criteria, and are deemed to be the applicable temperature criteria for that water body.

How are natural condition determinations tracked?

The State will track natural condition determinations on its standards webpage, which is available to the public.

Washington

What Natural Condition approach does Washington use?

Narrative approach where the natural condition automatically becomes the criterion.

What is written in Washington's Water Quality Standards?

“(2) Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.” (Water Quality Standards Chapter 173-201A-070 Antidegradation)

Does Washington formally revise water quality standards when invoking its Natural Condition provision?

No, Washington does not go through a formal revision to its water quality standards each time it implements this approach.

How is Washington's Natural Condition provision implemented: generally or site-specifically?

It is implemented on a site-specific basis as the need arises.

What are other unique attributes of Washington's approach?

Washington couples its automatic natural condition provision with a very limited allowance for some anthropogenic increase to the natural condition. According to WAC 173-201A-030 General water use and criteria classes, Washington allows the following increases:

Dissolved Oxygen. “(B) Marine water -- dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.”

Temperature. “(iv) Temperature shall not exceed 16.0 C (freshwater) or 13.0C (marine water) due to human activities. When natural conditions exceed 16.0C (freshwater) and 13.0C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3C.”

Tribes

Chehalis

Section 2. Definitions

(20) "Natural conditions" or "natural background levels" means surface water quality that was present before any human caused pollution.

Section 4. General Water Use and Criteria Classes

(iv) Temperature shall not exceed 16.0 C due to human activities. When natural conditions exceed 16.0C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3 C.

Section 8. Antidegradation

(2) Whenever the natural conditions of surface waters are of a lower quality than the criteria assigned, and uses are fully attained, the Department may determine that a site-specific criterion is appropriate. Such criterion shall be based on a determination of what constitutes natural condition. If a natural condition varies with time, the natural condition will be determined as the highest quality prevailing natural condition measured during annual, seasonal, or shorter time period prior to influence of human-caused pollution. The Department may, at its discretion, determine a natural condition for one or more seasonal or shorter time periods to reflect variable ambient conditions. The Department shall formally adopt such revised criterion following public review and comment.

Colville

Under each waterbody class under temperature there is the following:

Class I

(D) Temperature

(1) When natural conditions exceed 16.0 degrees C, no temperature increase will be allowed which will raise the receiving water by greater than 0.3 degrees C.

Kalispel

Definitions pertaining too natural conditions:

Natural background: Background conditions due only to non-anthropogenic sources. Water quality present prior to or without human-caused influences. A neighboring or similar system may be used as a reference.

Appropriate Reference Site or Region: A site on the same water body, or within the same basin or ecoregion that has similar conditions, and represents the biological potential based on best attainable condition, habitat structure, water quality, and potential based on best attainable condition, habitat structure, water quality, and biological parameters for a specific ecoregion, water body, or water body class.

There are several examples of natural conditions language within the Tribe's designated uses section:

Section 9) Antidegradation:

(a) Tier 1: Existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. When the Waters of the Reservation are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

Section 12) General Water Use and Criteria: (a) Brown Trout Spawning

1) Temperature shall not exceed 9°C as a moving 7-day average of the daily maximum temperatures with no single daily maximum temperature greater than 13°C. When natural background conditions prevent the attainment of the numeric temperature criteria, human-caused conditions and activities considered cumulatively can increase temperature levels by only an additional 0.3°C.

2) Dissolved oxygen shall not fall below 8mg/L at any time. When natural background conditions prevent attainment of the numeric dissolved oxygen criteria, all human-caused conditions and activities considered cumulatively can lower dissolved oxygen levels by only an additional 0.2mg/L.

(b) Adult Salmonid Migration

1) Temperature shall not exceed 18°C as a moving 7-day average of the daily maximum temperatures with no single daily maximum temperature greater than 20.5°C. When natural background conditions prevent the attainment of the numeric temperature criteria, human-caused conditions and activities considered cumulatively can increase temperature levels by only an additional 0.3°C.

2) Dissolved oxygen shall not fall below 8mg/L at any time. When natural background conditions prevent attainment of the numeric dissolved oxygen criteria, all human-caused conditions and activities considered cumulatively can lower dissolved oxygen levels by only an additional 0.2mg/L.

(e) Wildlife Habitat and Hunting

3) Temperature shall not exceed 18°C as a moving 7-day average of the daily maximum temperatures with no single daily maximum temperature greater than 20.5°C. When natural background conditions and activities considered cumulatively can increase temperatures levels by only an additional 0.3°C

Puyallup

Section 2. Definitions

(19) "Natural conditions" or "natural background levels" means surface water quality that was present before any human caused pollution.

Section 4. General Water Use and Criteria Classes

Class AA

(ii) Dissolved oxygen

(B) Marine water -- dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels can be degraded by up to 0.2 mg/L by human-caused activities.

(iv) Temperature shall not exceed 16.0C (freshwater) or 13.0C (marine water) due to human activities. When natural conditions exceed 16.0C (freshwater) and 13.0C (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3C.

Section 8. Antidegradation

(2) Whenever the natural conditions of said waters are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

Umatilla

Definition: Natural condition means surface water quality that existed before human-caused influence on, discharge to, or addition of material to the water.

Section O

1. The Tribes may revise criteria based on a reservation-wide or water-body specific basis as needed to protect aquatic life, including sensitive life stages, habitat, and human health; to protect designated uses; and to increase the technical accuracy of the criteria being applied.
2. Whenever the natural conditions of the surface waters of the Reservation are of a lower quality or higher quality than the criteria assigned, the Tribes may determine that the natural conditions shall constitute the water quality criteria.
3. If the natural condition varies with time, the natural condition will be determined as the prevailing highest quality natural condition measured during an annual, seasonal, or shorter period of time prior to human caused influence. The Tribes may, in its discretion, determine a natural condition for one or more seasonal or shorter time periods to reflect variable ambient conditions.
4. Historical data or data from an appropriate reference site, that represent natural condition, may be used to determine the criterion.
5. The Tribes shall formally adopt any revised criteria following public review and comment. Any modifications to the criteria in Table 3 (this is their toxics criteria table) will be adopted in regulation.
6. Revised criteria will be submitted to EPA, after adoption by the Tribes, for review along with any information that will aid EPA to determine the adequacy of the scientific basis of the revised criteria.

Warm Springs

Definitions

(30) “Natural Condition” means any physical, chemical, or biological condition existing in a water body before any significant human-caused influence on, discharge to, or addition of material to the water body.

(3) Where the naturally occurring quality parameters of waters of the Deschutes, Clackamas, and Santiam River Basins on the Reservation are outside the numerical limits of the above assigned water quality standards, the natural background water quality shall be the standard. Where no historical or background data exists, data collection and analyses for a 10 year period will be used to determine the standard. Data from an appropriate reference site, which reflects the natural condition, may also be used for this purpose. The Tribes will establish interim standards on a site-specific basis, according to Section 432.110.

4.32.110 Site Specific Criteria and Criteria Based on Natural Conditions

(1) The Tribe may revise criteria on a Reservation-wide or water body specific basis as needed to protect aquatic life and human health and other existing and designated uses and to increase the technical accuracy of the criteria being applied.

(a) Whenever the natural condition of the surface waters of the Tribes are of a lower quality than criteria assigned, the Tribe may determine that the natural conditions shall constitute the water quality criteria.

(A) If the natural condition varies with time, the natural condition will be determined as the prevailing highest quality natural condition measured during an annual, seasonal or shorter period of time prior to human caused influence.

(B) The Tribe, may, at its discretion, determine a natural condition for one or more seasonal or shorter time periods to reflect variable ambient conditions.

(C) Historical data or data from an appropriate reference site, that represent natural condition, may be used to determine the criterion.

(2) Any modification to the criteria, in Table 3, will be adopted in regulations.

(3) The Tribe shall formally adopt any revised criteria following public review and comment.

(4) Revised criteria will be submitted to EPA, after adoption by the Tribe, for review along with any information that will aid EPA to determine the adequacy of the scientific basis of the revised criteria.

Appendix B: Performance-Based Approach

From the preamble to EPA's Final Rule on EPA Review and Approval of State and Tribal Water Quality Standards (65 FR 24648, April 27, 2000) (aka "Alaska Rule")

As a general matter, States and authorized Tribes should also examine their administrative and rule-making procedures to identify opportunities by which their adoption of criteria, as well as EPA's approval, can be streamlined. One way to do this is through State or Tribal adoption of a performance-based approach. A performance-based approach relies on adoption of a process (i.e., a criterion derivation methodology) rather than a specific outcome (i.e., concentration limit for a pollutant) consistent with 40 CFR 131.11 & 131.13. When such a performance-based approach is sufficiently detailed and has suitable safeguards to ensure predictable, repeatable outcomes, EPA approval of such an approach can also serve as approval of the outcomes as well. If a particular state or tribal approach is not sufficiently detailed or lacks appropriate safeguards, then EPA review of a specific outcome is still necessary. However, even a more general performance-based approach would still help guide EPA review of specific outcomes.

The performance-based approach is particularly well suited to the derivation of site-specific numeric criteria and for interpreting narrative criteria into quantifiable measures. Proper construction and implementation of such an approach can result in consistent application of state and tribal narrative water quality criteria and defensible site-specific adjustments to numeric ambient water quality criteria. Changes to a designated use (including temporary changes, e.g., variances) do not lend themselves to a performance-based approach. Designated use changes and variances differ from criteria changes in that they modify the intended level of protection. In contrast, site-specific translations of narrative water quality criteria and site-specific adjustments to numeric ambient water quality criteria take additional information into account while protecting the designated use. As such the intended level of protection is no way modified. In addition, making use changes and issuing variances must include an evaluation of "attainability" of a designated use, taking into account factors such as natural conditions or economic and social impacts. See 40 CFR 131.10(g).

A performance-based approach relies on the state or authorized tribe specifying implementation procedures (methodologies, minimum data requirements, and decision thresholds) in its water quality standards regulation. Adopting implementation procedures into state and tribal regulations establishes a structure or decision-making framework that is binding, clear, predictable, and transparent. During the adoption of the detailed procedures, all stakeholders and EPA have an opportunity to make sure that important technical issues or concerns are adequately addressed in the procedures. The state or tribal implementation procedures must also consider any special needs of federally listed threatened or endangered species or their critical habitat. Under section 7 of the ESA, EPA would have to consult with the Services on the detailed implementation procedures as part of its approval process if EPA's approval may affect a listed species. State and authorized tribal water quality standards programs which include appropriate performance-based approaches for water quality criteria could benefit the authorized tribe or state by better positioning them to tailor standards to specific watersheds and ecosystems by streamlining administrative processes associated with refining criteria necessary to protect designated uses. This approach is particularly useful for criteria that are heavily influenced by site-specific factors such as nutrient criteria or sediment guidelines. Such procedures must include a public participation step to provide all stakeholders and the public an opportunity to review the data and calculations supporting the site-specific application of the implementation procedures. The state or tribe would need to maintain a publicly available, comprehensive list of all site-by-site decisions made using the procedures; however, such decisions

would not, as a federal matter, have to be codified in state or tribal regulation. Although the state or authorized tribe would not need to obtain separate EPA approval for criteria derived through an approved performance-based approach, such criteria would nonetheless need to be provided to EPA for inclusion in the CWA WQS Docket. When EPA reviews the results of a state or authorized tribal triennial review, EPA expects to evaluate a representative subset of the site-specific decisions to ensure that the state or authorized tribe is adhering to the EPA approved procedure. Since the procedures would be adopted into state or tribal regulation, the state or authorized tribe would be bound by the decision-making framework contained therein. Any water quality criteria which were not derived in accordance with the approved implementation procedures would need separate approval from EPA to be the applicable CWA standard. If a state or authorized tribe failed to follow those procedures and did not obtain separate EPA approval of the criteria, EPA would have a basis for disapproving a TMDL or objecting to an NPDES permit for not deriving from or complying with applicable standards (see 40 CFR 122.44(d)). Both TMDL development and NPDES permit issuance have mandatory public participation, which provides further safeguards over implementation of a performance-based approach.

EPA used this approach to ensure consistency in future ambient water quality criteria development among the eight Great Lakes States in the Great Lakes Initiative (see 40 CFR Part 132). EPA, the eight Great Lake States, and stakeholders (e.g., regulated community, general public, environmental groups) developed detailed criteria methodologies that states and authorized tribes in the Great Lakes basin are required to adopt and utilize for criteria derivation. These methodologies ensure scientific integrity and transparency in decision-making among the Great Lakes states as new or revised criteria are derived. EPA also authorized this approach in the National Toxics Rule (see 57 FR 60848). States in the NTR are allowed to modify the federal criteria site-specifically using EPA's Water Effects Ratio (WER) methodology. EPA's WER methodology is sufficiently detailed so that its site-specific application is formulaic and predictable.

In sum, the key to a performance-based WQS program is adoption of implementation procedures of sufficient detail, and with suitable safeguards, so that additional oversight by EPA would be redundant. EPA will be developing more detailed guidance on performance-based water quality standards programs in the near future.

Appendix C: Use Attainability Analysis

In accordance with the Federal Water Quality Standards Regulations (40 CFR Part 131), states and tribes may remove a designated use that is not an existing use or establish sub-categories of a use with less stringent criteria if the state or tribe can demonstrate that attaining the designated use is not feasible through development of a Use Attainability Analysis (UAA). A UAA is a structured scientific assessment of the factors affecting the attainment of the use that may include the following physical, chemical, biological, and economic factors. The regulations state that a use may be removed or downgraded if the state or tribe can demonstrate that attaining the use is not feasible because:

- (1) Naturally occurring pollutant concentrations prevent the attainment of the use; or
- (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state or tribal water conservation requirements to enable uses to be met; or
- (3) Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
- (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
- (5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
- (6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

States and tribes may not remove designated uses if they exist unless a use requiring more stringent criteria is added; or the use will be attained by implementing effluent limits required under 301(b) and 306 of the Clean Water Act and by implementing cost-effective and reasonable best management practices for nonpoint source control.

(Code of Federal Regulations, 40 CFR Part 131.10)

Appendix D: Natural Condition Definitions in State and Tribal Water Quality Standards

How is natural condition defined in the water quality standards?

States

- Alaska: “Natural condition” means any physical, chemical, biological, or radiological condition existing in a water body before any human-caused influence on, discharge to, or addition of material to, the water body;
- Idaho: “Natural Background Conditions” means “No measurable change in the physical, chemical, biological, or radiological conditions existing in a water body without human sources of pollution within the watershed.”
- Oregon: Natural Conditions means conditions or circumstances affecting the physical, chemical, or biological integrity of a water of the state that area not influenced by past or present anthropogenic activities. Disturbance from wildlife, floods, earthquake, volcanic or geothermal activity, wind, insect infestation, diseased vegetation are considered natural conditions.
- Washington: “Natural conditions” or “natural background levels” means surface water quality that was present before any human-caused pollution. When estimating natural conditions in the headwaters of a disturbed watershed it may be necessary to use the less disturbed conditions of a neighboring or similar watershed as a reference condition.

Tribes

- Chehalis: “Natural conditions” or “natural background levels” means surface water quality that was present before any human caused pollution.
- Kalispel: “Natural background”: means background conditions due only to non-anthropogenic sources. Water quality present prior to or without human-caused influences. A neighboring or similar system may be used as a reference.
- Puyallup: “Natural conditions” or “natural background levels” means surface water quality that was present before any human caused pollution.
- Umatilla: Natural condition means surface water quality that existed before human-caused influence on, discharge to, or addition of material to the water.
- Warm Springs: “Natural Condition” means any physical, chemical, or biological condition existing in a water body before any significant human-caused influence on, discharge to, or addition of material to the water body.

Appendix E: Table of Related Concepts and Definitions

Term/Concept	How State and Others Use the Term	Recommendations
Ambient	<p>This term is not defined in R10 State standards.</p> <p>Idaho's <i>Surface Water Ambient Monitoring Plan</i> (Idaho Dept. of Environmental Quality, October 2004) uses an EPA definition of ambient: General conditions in the environment. In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations, or specific disturbances such as a wastewater outfall (EPA 1996).</p>	Almost always includes human impacts, NOT equivalent to natural condition or natural background
Natural background	Includes no anthropogenic impact	Essentially synonymous with natural condition, though background often refers to something that can be measured as a concentration, while “condition” may be more general.
Background	<p>Used quite variably, often means “upstream.”</p> <p>The concept is often used to isolate impacts of a specific land use or industrial facility.</p>	Not necessarily synonymous with “natural.” Users of the term should specify how they are defining it.
Reference condition	<p>Often used to describe an ideal condition: The physical, chemical and biological characteristics of a water body in the absence of human disturbance and pollution.</p> <p>However, the term is also used to characterize a current, but altered condition. See the specific sub-categories of reference condition described below.</p> <p><u>Region 10 example</u> Idaho's <i>Surface Water Ambient Monitoring Plan</i> (Idaho Dept. of Environmental Quality, October 2004) defines reference condition in two ways:</p> <ol style="list-style-type: none"> 1. a condition that fully supports applicable beneficial uses with little effect from human activity and represents the highest level of support attainable. 2. A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and applying expert judgment (Hughes, 1995). 	<p>When used in this manner, the term is synonymous with natural condition</p> <p>Use of the term should include a specific definition of how it is being used. In many cases, it is not synonymous with natural condition.</p>

Term/Concept	How State and Others Use the Term	Recommendations
Reference site or reference watershed	<p>An actual location– may or may not be equivalent to natural. This is an operational definition that depends upon the assessment question(s) being asked and the type of comparisons being made.</p> <p>Idaho's <i>Surface Water Ambient Monitoring Plan</i> (Idaho Dept. of Environmental Quality, October 2004): A specific locality on a water body that is minimally impaired and is representative of the expected ecological integrity of other localities on the same water body or nearby water bodies (EPA, 1996).</p>	<p>Use of the term should be specified. The necessary similarities between the reference and assessment sites or watersheds should be documented. These include, but are not limited to watershed size, stream gradient, soils, geology, elevation, and other characteristics relevant to the parameter being evaluated.</p>
System potential	<p>States have defined the system potential of the natural flow regime as part of their analysis used to set TMDL targets for temperature. Local expertise and existing information are used to describe vegetation change and channel condition, which are input into a model used to quantify heat loads.</p>	<p>System potential does not necessarily address all aspects of the chemical, physical and biological characteristics of the stream. It may be determined for urbanized areas or areas with other significant alterations to hydrologic and channel conditions, thus it does not necessarily describe a purely natural condition.</p>
Insignificant anthropogenic contribution		<p>Define the basis for the definition of “insignificant” and for the conclusion that potential changes are below that level.</p>
No measurable increases (due to anthropogenic sources)		<p>Define the basis for the definition of “measurable” and for the conclusion that potential changes are below that level.</p>
Irreversible effects or impacts		<p>NOT equivalent to natural condition</p> <p>When using the term, be extremely explicit as to what effects are considered irreversible and why.</p>

Terms for Types of Reference Sites

Term/Concept	How States Use the Term	EPA Recommendations
Minimally impacted/minimally disturbed	<p>A specific category of reference site: the term acknowledges that few if any locations are truly unaffected by humans, but that there are locations where the impacts are very slight, possibly historic, and may not affect the resource being assessed.</p> <p>These do not exist for all ecoregions.</p>	<p>These locations may be as close as we can ever come to “natural” in terms of a location where measurements can be made.</p> <p>This is the type of reference site most often used in environmental assessments.</p> <p>Be as specific and quantitative as possible. Document the basis for the conclusion that the location is minimally impacted. Describe potential impacts as specifically and quantitatively as possible.</p>
Best available	<p>A specific category of reference site: synonymous with least disturbed or “best of what’s left”</p> <p>This is the type of reference site used for biomonitoring in areas where minimally disturbed site(s) or areas do not occur.</p>	<p>Not generally natural or pristine. In some ecoregions, this may be the best of the sampleable locations from which data can be collected.</p> <p>Describe the screening process used to locate these sites in detail and as quantitatively as possible.</p> <p>The disturbance level should be described clearly with respect to population, road miles, road density, land use, acres logged, or other characteristics relevant to the analysis.</p> <p>Although such locations can be acceptable as sites for biological monitoring, they may not qualify as defining “natural.” Documentation of the level and type of disturbance should be combined with a scientifically justifiable case that demonstrates that the level of disturbance has not significantly affected the water quality parameter(s) that exceed standards. For systems that are highly altered throughout their extent, the natural conditions provision is not appropriate. Instead, consider conducting an UAA (Use Attainability Analysis).</p>

Appendix F: Addressing Natural Conditions in Water Quality Standards and In Practice

Approach	Implications for NPDES permits, 303(d) listing and TMDLs
Site-specific criterion through rule-making	<ul style="list-style-type: none"> • A change to water quality standards requiring state or tribal adoption as well as EPA review, approval and ESA consultation prior to application and use. • Public review required prior to adoption. • Requires rule-making process which can be very lengthy and time consuming • If the need is triggered by a TMDL or NPDES permit, close coordination between NPDES, standards and TMDL staff (State and EPA) is required. • Most resource and time-intensive. • Since rule-making sometimes is highly dependent on Legislative action, this approach can be a difficult and politically sensitive process at times. • The natural condition should be quantified. Uses fixed number that is measurable. Brings more focus on the number (and whether it is the right number). • Provides a simple way for other CWA programs, such as 303(d) listing, TMDLs and NPDES permitting, to determine which criterion applies to a specific water body and pollutant.
Site-specific criterion through performance-based approach	<ul style="list-style-type: none"> • “Appends” the new natural condition number to the water quality standard until a later triennial review when it can be put into rule language. EPA review and approval only needed for the provision, not each case of implementation. • Does not require formal rule-making at the time the WQS is changed to reflect the natural condition. EPA recommends the state and tribe have some formal mechanism in place for recording and tracking these changes. • EPA recommends that the state and tribe use the performance-based approach to officially incorporate the water quality criteria changes into their WQS during the next state or tribal triennial review to further ease the tracking natural conditions criteria adjustments. • EPA does not need to review and approve these additions to the state and tribal WQS. • The natural condition should be quantified. Uses fixed number that is measurable. Brings more focus on the number (and whether it is the right number). • Public review may occur in the context of a related action, such as TMDL development or NPDES permitting.
Automatic Provision Through a Narrative Water Quality Criterion (natural condition automatically becomes the criterion)	<ul style="list-style-type: none"> • Does not require a formal change or rule-making to the WQS. • The process used to determine the natural condition needs to be sufficiently documented and repeatable, such that it can be reviewed with in the context of the implementing action i.e., procedure and methods are detailed within the TMDL documentation. • A method should be developed to keep track of water bodies and pollutants in which natural conditions have replaced existing criteria. • Not always a consistent application; very diverse interpretations of what constitutes an adequate demonstration. • Less time-intensive than other approaches, thus allowing the implementation to occur more quickly. • Public participation occurs at the time of other actions such as 303(d) listing, TMDL development or NPDES permitting. • With respect to 303(d) listing, need only describe why the condition is natural without determining a specific number or requiring additional monitoring. • Level of detail and effort involved in determining natural condition can be more easily adjusted based on available data and information.

Approach	Implications for NPDES permits, 303(d) listing and TMDLs
<p>Numeric increment of allowed anthropogenic source (no measurable increase of anthropogenic sources) (Note: this is not a specific approach; this reflects wording of specific water quality criterion such as temperature criterion in some of the NW States)</p>	<ul style="list-style-type: none"> • Often requires quantification of natural condition. • May allow for quantification of anthropogenic sources instead of natural conditions. • No direct public participation required. Therefore, public notification should occur at the time of other actions such as 303(d) listing, TMDL development or NPDES permitting. • Not always a consistent application; very diverse interpretations of what constitutes an adequate demonstration. • Less time-intensive than other approaches, thus allowing the implementation to occur more quickly. • With respect to 303(d) listing, need only describe why the condition is natural without determining a specific number or require additional monitoring. • Level of detail and effort involved in determining natural condition can be more easily adjusted based on available data and information.

Appendix G: Technically Approaches to Determine Natural Condition

Method	General Description of Data Collection/Documentation Associated with this Method	Comments
Estimate from data collected in water body	<ul style="list-style-type: none"> Collect data in absence of development / disturbance. Document lack of human disturbance. Data should be adequate in quality and quantity. 	
Estimate from reference condition	<ul style="list-style-type: none"> Use either upstream reference or nearby comparable reference. Document similarities, document level of disturbance. Data should be adequate in quality and quantity. Statistical calculations should be appropriate to the data set. 	If minimally disturbed reference site is used in TMDL development, then the state or tribe needs to make a scientifically credible case that the disturbances do not affect the parameter of interest.
Model to simulate undisturbed conditions	<ul style="list-style-type: none"> Demonstrate that model is appropriate in scale and complexity to the question being asked. Tie conceptual model to mechanistic model. Document assumptions, source of input parameters, uncertainties. Be explicit about what the model does not include. 	<p>Generally, EPA prefers monitoring data describing the undisturbed condition. However, if data are lacking, models can be used and selection of the model depends on a variety of factors outlined in Compendium of Tools for Watershed Assessment and TMDL Development for considerations when or if selecting a model.</p> <p>For temperature: In estimating natural background conditions the best available temperature modeling techniques should be employed that capture to the greatest extent practicable all the human impacts that affect river temperatures. Those human impacts that cannot be captured in a model should be identified in the TMDL along with rough estimates of their contribution to elevated water temperatures. When using this method, it is recommended that estimates of natural conditions should be revisited periodically as our understanding of the natural system and temperature modeling techniques advance (from Temperature Guidance).</p>

Method	General Description of Data Collection/Documentation Associated with this Method	Comments
Negative elimination: Estimate eventual condition after quantifying and eliminating anthropogenic inputs	Removing human impacts and then setting what remains as a “natural condition.”	